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or tramp; from *latcha*, to build, we have, in the frequentative or usitative form, *laltshish*, an architect; from *tedsha*, to wash, *tetdshish*, laundress. Almost endless examples might be given, showing the wealth of varied expressions which the language derives from this form of inflection.

Of the more ordinary class of inflections, derivational and grammatical, produced, like most of those in the Aryan tongues, by the agglutinative process, the Klamath has a vast number. Mr. Gatschet gives a list of formative affixes, filling more than a hundred quarto pages, and rivalling in extent and variety the list comprised in the second volume of Brugmann's "Comparative Grammar of the Indo Germanic Languages." The prefixes exceed fifty, and the suffixes two hundred. These affixes have sometimes internal euphonic inflections. The prefix *hash*, or *hesh*, for example, which forms causative, reciprocal, and reflective verbs, varies its vowel in a certain correspondence or euphonic correlation (though not always agreement) with the varying vowel of its radical. From *pan*, to eat, we have *hášpa*, to feed or cause to eat; from *uámpeli*, to recover, *heshuámpeli*, to restore to health; from *pánua*, to drink, *hushpanua*, to give to drink. *A* is a common suffix, which forms verbs from nouns, adjectives, and particles; *ka* is a "factitive" suffix, forming causative and transitive verbs; *ank* is the suffix which forms the present participle, like the Latin *ans* and *ens*, and the English *ing*. An example will show the fine shades of meaning in the derivatives formed by these suffixes. *Hewa* or *shewa*, to suppose, believe, think, coalesces with the reflexive prefix *hush* to form a new verb *husha*, to remember. The factitive affix *ka*, added to *husha*, produces *hushka*, to think about a thing, to study. The active participle of *hushka* is *hushkank*, thinking, studying. Adding to this the verb-forming particle *a*, we obtain the derivative verb *hushkanka*, to be reflecting or considering, to be in a certain mood or state of mind about anything. These word-forming particles yield an enormous addition to the Klamath vocabulary.

The declensions of nouns and adjectives resemble those of the Aryan languages, but are more extensive and more logically exact. There are fourteen cases, comprising, besides those of the Sanscrit, Greek, and Latin, several locative cases, and a temporal case. The latter ends in *emi* or *ám*, and signifies "during" or "at the time of;" as from *sko*, spring, we have *skoémi*, during springtime; from *kish*, sunset, *kishémi* or (contracted) *kissám*, at sunset. The accusative (or objective) case of "inanimate" nouns—corresponding to the Latin neuter—has (as in Latin) the same form as the nominative; but that of animate nouns ends in *ash*, or sometimes simply in *sh* or *a*. Thus *laki*, chief or head-man, has in the accusative *lakiash*; *muni*, great, has *muyánash*. The adjective agrees with its noun in case and number, though with some variations in the forms; thus from *muni laki*, great chief, we have in the genitive (or possessive) case *muyánam lakiam*, of the great chief; in the accusative, *muyánash* (or *munish*) *lakiash*; in the instrumental case, *muyántka lakitka*, by means of the great chief; in the directive case, *muyán'sh* (or *munish*) *lakiashtala*, toward the great chief, etc. The distributive form, which answers for the plural, has, in the nominative, *múmeni laldáki*, each great chief; in the accusative, *mumidn'sh* (or *múmenish*) *laldkiash*; in the possessive, *mumidnam laldkiam*, of each great chief; and so on, through the various cases.

Space fails for describing the conjugations of the verb, except to mention the two participles, so curiously resembling the Aryan forms, namely, the present (or indefinite),

ending usually in *ank* or *an*, and the preterite, ending in *tko* or *tk*; as from *koka*, to bite, *kokank* or *kokan*, biting, and *kokatko*, bitten. The substantive verb *gi* or *ki* (pronounced *ghee* or *kee*) has for its present participle *gian* or *giank*, being, and for its preterite *gitko*, been. As an auxiliary verb it is used, in its various inflections, with the past participle of other verbs to form the passive voice, as in *kokátko gi*, to be bitten; *kokátko giuapk*, will be bitten; *kokátko gít*, may be bitten; *kokátko giuga*, in order to be bitten. This substantive verb has a signification as abstract as the same verb in any Aryan or Semitic language, with often a wider compass of meaning, answering to both *ser* and *estar* in Spanish.

The pronouns, personal and possessive, are never combined with either the noun or the verb. What some grammarians have styled the transitions, and others the composite or objective conjugations, are therefore unknown to the Klamath, which in this respect is as analytic as the English or German, and far more analytic than either Greek or Hebrew.

Mr. Gatschet, after describing the great variety of structure in the American languages, varying from the extremely synthetic to the markedly analytic, observes that the Klamath "occupies a middle position" between these extremes, "but that, nevertheless, it shows very plainly all the characteristics of agglutinative tongues." He should have added—as his own minute and careful descriptions clearly show—"but not more plainly than these characteristics are displayed by the Sanscrit or the Greek." Liberal and philosophical as he is, he has not yet succeeded in entirely emancipating his mind from the influences of the Aryo-Semitic superstition, which is now in comparative philology what the geocentric superstition, before the time of Copernicus, was in astronomy. But he proceeds, in terms as accurate as they are elegant and forcible: "These and other characteristics impart to the language of the Maklaks a well-defined type, and approach it to the tongues of modern Europe, in which analysis has not preponderated over synthesis. An attentive study of the numerous texts obtained from the Indians [of which, it should be added, Mr. Gatschet's work furnishes an ample and most interesting collection] paired with constant comparison of Klamath structure with the structure of many foreign and American languages, could alone furnish a solid basis for establishing the grammatical rules of this upland tongue. The rhythmic, stately, and energetic tenor of its periods, especially those of the larger mythologic pieces, will please every student who has ever lent his attentive ear to the well-poised periods of Roman historians, and will even evoke comparison with them, not as to their contents, but as to the plan of the well-constructed sentences which appear in these narratives."

HORATIO HALE.

Clinton, Ontario, Canada.

#### IOWA ACADEMY OF SCIENCES.

As announced, the sixth annual session of the Iowa Academy of Sciences was held in Des Moines, on the 29th and 30th of December. Interest and enthusiasm were manifested throughout the session. Heretofore the annual meetings have been held in September, an unfortunate time for most of the scientific workers of the State. The following programme was carried out.

Professor C. C. Nutting, the president, delivered an address on "Systematic Zoology in Colleges." He urged the importance of systematic zoology in colleges. He thought

it unfortunate that the German craze for morphology should occupy so much attention in colleges to the exclusion of very important systematic work. He would not, however, belittle the work of the morphologist, since the whole structure of the systematic zoologist rests largely on the results of his labors. One reason why systematic work has failed to command the attention that it deserves on the part of the college student is a wide misapprehension as to its real nature and scope. A majority of students are wont to regard systematic zoology as particularly to be shunned on account of what they consider its most essential character—an endless succession of fearful names, a veritable nightmare of polysyllabic horrors, the dead languages resurrected for the special discomfort of the unfortunate student. Systematic zoology is much more than a collection of names. Classifications are but the skeletons which his studies and investigations should clothe with living facts, so that finally the dry bones will be almost forgotten as he contemplates the beauty and symmetry of the well rounded vital structure.

Professor F. M. Witter read two papers on "Arrow Points from the Loess" and "The Gas Wells near Letts, Iowa." The hills on which the city of Muscatine stands are covered with a very fine deposit of loess, which in some places must be nearly fifty feet thick. This loess abounds in land shells, the bones of at least two American reindeer, a considerable part of the antler of the elk or common deer. The ancient loess lake is nearly 150 feet above the present high-water of the Mississippi. In this loess deposit has been found an arrow point and a spear point. In it also occur fragments of the tooth of an elephant. Professor Calvin, in discussing this paper, remarked that arrow points had been found in the loess at Council Bluffs some years ago. He also referred to a skull found in Iowa that resembled the famous Neanderthal skull. That man was undoubtedly contemporaneous with the elephant shortly after the great ice age.

In speaking of the gas wells of Letts, Iowa, which have been flowing since December, 1890, Professor Witter thought it due to the decomposition of organic matter in the lower part of the drift material. Professors Call and Calvin both remarked that the flow of gas would not be permanent; it was wholly unlike the gas of Ohio and Indiana. Chemical examination has shown that this gas is closely related to marsh gas.

Professor Haworth read papers on "Melanite from Missouri," and "Prismatic Sandstone from Madison County, Missouri" (read with consent of the state geologist). He also presented a paper on "Limonite Pseudo-morphous after Calcite."

Professor J. E. Todd read a paper on "Striation of Rocks by River Ice." Specimens were exhibited showing striae. These were observed at St. Louis, Cape Girardeau, Mo., and Sioux Falls, So. Dakota, also at several points along the Missouri. He also presented, by title, a paper on "Further Notes on the Great Central Plains of the Mississippi."

Professor Calvin gave an account, showing specimens, of the distinctions between *Acervularia davidsonii* and *A. profunda*. The species are quite distinct, not only does this difference appear in the external characters, but when they are polished. Both species occur in Iowa, sometimes in the same geological formation.

Professor Call spoke of "The Present Status of Artesian Well Investigation in Iowa." This work has been done in connection with the Iowa State Weather and Crop Service. The artesian wells are very numerous and extensive. Many of the so-called artesian wells are not artesian wells in the

sense that Professor Call uses the term. As an instance, he cited the wells at Dunlap and Council Bluffs, which are not artesian, since water does not flow under hydrostatic pressure. Professor Todd took issue with him on this point. The wells at those places are on high elevated portions of the country. If they had been bored on lower ground, a short distance away, they would produce flowing water.

Mr. Charles R. Keyes presented three geological papers as follows: "Geological Structure and Relations of the Coal Bearing Strata of Central Iowa," "Brick and Other Clays of Des Moines," and "Aluminium in Iowa." The clay used at Hampton, Iowa, where a large stock company has recently been organized, is said to be the richest in the country, yielding eight ounces per bushel, or three ounces more than is produced in any known deposit of the neighboring States. Aluminium is soon to take the place of iron to a large extent in the arts, and the value of the early development of the industry cannot be overestimated. In speaking of the brick and other clays of Des Moines, he said that perhaps no province in the Union is better supplied with raw material of unexcelled quality for the manufacture of those objects commonly made from clay than our own State.

The only chemical papers were those presented by Professor G. E. Patrick. One was on "Sugar Beets in Iowa." Something over 500 samples from more than half the counties of the State have been analyzed. The results are highly gratifying. Though the sugar content on an average is less than in Nebraska, the yield is considerably more. More sugar can be grown on an acre in Iowa than in Nebraska. It was also shown that beets on the station farm, although under the best of culture, contained less sugar than those of Muscatine, which is owing to soil conditions. Certain portions of this State are apparently well adapted to the growing of beets for sugar production, and he mentioned the fact that of the 500 samples of beets recently analyzed at the Experiment Station, sent in from all parts of the State, the best have come—and in large numbers—from the regions about Davenport and Muscatine. He added, however, that "there may be other parts of the State just as well adapted to the beet-sugar industry as the localities here named." Professor Patrick's other paper was on the subject, "Can Fat be Fed into Milk, i.e., Can the Composition of Milk be Modified by Variations in the Kind of Food?" As opposed to the writings of several other scientists who deny food influence upon the composition of milk, he cited a number of European and American experiments,—one of which was recently performed at the experiment station at Ames,—which seem to prove conclusively that the kind of food fed to cows does have a material influence upon the percentage of butter-fat in the milk.

Professor S. E. Meek presented a paper "On the Fish Fauna of Arkansas and Iowa Compared." The river basins of eastern Iowa contain many more species than the river basins of the western part of the State. About 120 species occur in the State. Arkansas, which has not been thoroughly explored, contains 150; the darters being more numerous in Arkansas than in Iowa.

Professor R. E. Call exhibited a specimen of "An Abnormal Hyoid Bone in the Human Subject."

Professor H. L. Bruner, in a paper on "An Aboriginal Rock Mortar," referred to relics found on the east slope of the Franklin Mountains, about eleven miles north of El Paso, Texas, and near the mouth of the "Hous Cañon."

Professor Tilton found near Indianola, Iowa, a three-legged snow-bird, which was exhibited. In domestic animals this

is not an uncommon occurrence, though it is rather rare in wild animals

Four entomological papers were read. Professor Herbert Osborn presented two, on "The Orthopterous Fauna of Iowa" and "Notes on Certain Iowa Diptera." Sixty-seven species were enumerated. The notes were based on specimens found almost entirely in the central part of the State. The Orthoptera are among the most important of the injurious insects of this State, almost all the species being destructive, and scarcely one that can be considered as of any benefit. A Texas species, *Arphia conspersa*, was reported from Ames; *Periplaneta orientalis*, apparently confined to larger cities; and *Platamodes pennsylvanica*, very common in doors and out. Professor Osborn and H. A. Gossard presented some "Notes on the Life History of *Agallia sanguinolenta*." This leaf-hopper, though a clover pest, also feeds on beets, rutabagas, cabbages, and blue-grass. It is active even in midwinter, on sunshiny days. The first brood of larvæ appear between early May and July 1. The earliest individuals of the brood are nearly matured by the first of July. Larvæ can be found, in all stages, from this time until the advent of winter. Most of the individuals are believed to be included in two broods.

Professor C. P. Gillette, in a paper on "How the Female of *Cacœcia semifera* Protects Her Egg-Clusters," stated that one of the most novel methods is that employed by the box-elder leaf-roller. The egg patches are covered over with a gluey material, and this is nearly always completely covered with a dense mass of scales placed like shingles on a roof. These scales closely resemble those found on the under side of the abdomen.

Professor T. H. McBride gave a talk on "Slime Moulds of Iowa." These organisms are especially interesting not only because of the beauty of the structures themselves but also on account of their relationships to other living things. Are slime moulds plants or animals? The slime moulds of Iowa need investigation. Our flora (regarding them as plants) is comparatively rich in this direction. The proper reference of fruit to plasmodium is as yet little known in many species. Slime moulds exhibit periodicity in their appearance,—sometimes fail in a given locality for years, and then abundantly reappear.

Botanical papers were presented by Professor L. H. Pammel. One was on "Bacteria of Milk." A large number of cultures were exhibited. In the "Report of Committee on State Flora" several interesting species new to the State were mentioned. Muscatine seems to be especially favored with some southern plants, like *Rhexia Virginica*, *Carya olivæformis*, and *C. sulcata*. Weeds like *Solanum rostratum*, *S. carolinense*, *Cnicus arvensis*, etc., are spreading. A third paper was presented on the subject of "Phænological Notes." One of the interesting questions in connection with our flora is the relation that climate has to our wild plants, the time of leafing, flowering, and fall of leaves, as well as the effects of frost on plants. In 1886, the soft maple (*Acer saccharinum*) was in flower on Mar. 22; in 1891, Apr. 11. *Ulmus Americana*, in 1886, in flower, Apr. 12; in 1891, Apr. 18. The succession of flowers in herbaceous plants in 1886 and 1891 was: *Hepatica acutiloba*, Apr. 9 (1886), Apr. 12 (1891); *Capsella Bursa-pastoris*, Apr. 15 (1886), Apr. 24 (1891); *Mertensia Virginica*, Apr. 20 (1886), Apr. 28 (1891). Frost and its effects on some plants were noted: *Portulaca oleracea*, early in September, tips frost-bitten; Oct. 7, more or less destroyed; Oct. 9, plants black in an open field; *Panicum sanguinale*, injured seriously on

Oct. 8; *Borrigo officinalis*, Oct. 22, a few leaves affected; Oct. 23, many leaves killed; *Scabiosa atropurpurea*, Oct. 7, no injury; Oct. 23, no injury; Nov. 11, no injury; Nov. 21, some injury to leaves. In a paper on "Experiments in the Prevention of Corn Smut," made at the Iowa Experiment Station, it was shown that by treating seed corn with ammoniacal carbonate of copper and copper sulphate no beneficial results were obtained. In plot No. I., treated, there were 6 smutted plants against 8 in check; in plot II., 6 smutted plants against 7 in check; in plot III., 42 smutted plants against 38 in check; in plot VII., 38 smutted plants against 32 in check. These experiments should not be considered as showing conclusively that smut does not enter the delicate tissues of corn by way of the seed. Incidentally he referred to some experiments now carried on at the college farm, in which ammoniacal carbonate of copper, Bordeaux mixture, and other substances were mixed with soil, in which, afterward, corn was planted. Ammoniacal carbonate of copper in the soil retards the germination of corn.

The following papers also appeared on the programme: Miss Minnie Howe, "Some Experiments for the Purpose of Determining the Active Principles of Bread Making;" Dr. N. B. Niles, "The Action of Disinfectants on Nutrient Media;" Professor J. S. Tilton, "Erosion by Middle River for November, 1891."

A committee of five was appointed to ask the legislature to print the Proceedings in connection with the Annual Report of the Iowa Weather and Crop Service. Mr. J. R. Sage, Professors Nutting, Haworth, Davis, and Pammel constitute the committee. The officers of the Academy for 1892 are: C. C. Nutting, president, Iowa City; L. H. Pammel, first vice-president, Ames; E. Haworth, second vice-president, Oskaloosa; Herbert Osborn, secretary and treasurer, Ames; executive council, the officers and J. E. Todd, Tabor; F. M. Nitter, Muscatine; and R. E. Call, Des Moines.

#### LETTERS TO THE EDITOR.

\*\* Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

#### Traumatic Hypnotism.

HYPNOSIS is a psychical state in which an individual is more than usually susceptible to suggestions. As is well known, the degrees of suggestibility are many. Making the distinction between physiological and pathological hypnotism, the traumatic hypnotism would, of course, fall under the latter head. We have been led to employ the term "traumatic," from an investigation of the following case. The case is all the more interesting, since the patient is a physician.

Patient says: "I was in a village cart coming up the street; the horse was spirited; a man tried to stop him from running away. The last thing I remember is calling to him to get out of the way. The following (of which I was unconscious) has been told me by others: the cart struck another wagon and threw me into the air, and I came down in a heap, as if one were going to dive into the water, striking on my back and side, having the lines wound around my hands. I was pulled forward and up by the horse starting, and dragged about twenty feet, when the lines slipped off of my hands. I did not say anything at this moment; they picked me up for dead and carried me into a drug store. I then began to talk with them, looking deathly pale. They asked me if I was hurt, I answered, 'No, not at all, I am all right.' I would moan every now and then during the conversation. Quite a number of my friends came in, and I called one by name. Then I took off my bonnet and walked back where I could wash my